REMARKS

The claims have been amended to more clearly define the invention as disclosed in the written description. In particular, claim 4 has been cancelled, while claims 3, 12 and 16 have been amended to include the limitations of cancelled claim 4.

The Examiner has finally rejected claims 3, 5, 12 and 16 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,402,124 to Todd et al. in view of U.S. Patent 5,946,652 to Heddle. The Examiner has further finally rejected claims 7, 9 and 15 under 35 U.S.C. 103(a) as being unpatentable over Todd et al. in view of Nishio et al. Applicant acknowledges that the Examiner has found claims 4 and 8 allowable over the prior art of record.

In view of the above changes, Applicant believes that the Examiner's rejection with regard to Todd et al. and Heddle has been overcome.

The Todd et al. patent discloses encoder and decoder with improved quantizer using reserved quantizer level for small amplitude signals, in which a ditherer 110 adds a dither component to a filtered digital signal, the dither component being produced by a pseudo-random number generator, and a quantizer 112 for quantizing the output from the ditherer 110 (see Fig. 10). Todd et al. further discloses a decoder in which an encoded signal is applied to a dequantizer 208, a ditherer 210 and an inverse filter bank 212 in order to recover the input signal.

The Nishio et al. patent discloses noise reduction method and apparatus utilizing filtering of a dithered signal, in which, as noted by the Examiner, the encoded dithered signal is recorded on a recording medium such as a compact disc (CD).

The subject invention, as claimed in claim 7, includes "adding a pseudo-random noise signal to the digital input signal to form an intermediate signal, the pseudo-random noise signal being defined by noise parameters", "quantizing the intermediate signal having a word length of n bits to a reduced word-length signal having a word length of m bits, where n and m are integers, n being larger than or equal to m, the quantizing of the intermediate signal including a first transfer function which his non-linear, the first transfer function being defined by non-linear device parameters", and "recording the reduced word-length signal, the non-linear device parameters and the noise parameters as the encoded signals on a recording medium".

The Examiner now states "Nishio et al. teaches the reduced word-length dithered signal recorded on a compact disk FIG. 14 (column 11 line 65-column 12 line 8). As Todd's encoder and decoder with dither method for audio signals, at the time of the invention, it would have been obvious to a person of ordinary skill in the art to store the Todd's audio signal in the CD using the Nishio et al.'s method that the audio signal as the reduced word-length

signal with the non-linear parameters (provided by the quantizing), and the noise (provided by the dithering)."

Applicant submits that the storing of Todd et al.'s audio signal in the CD using the Nishio et al. method is the same as merely recording a reduced word-length signal on, for example, a CD. However, the subject invention further includes storing the non-linear device parameters as well as the noise parameters on the recording medium.

The combination of Todd et al. and Nishio et al. relates to encoding a digital signal to form a reduced word-length signal and decoding the reduced word-length signal in order to reform the input digital signal. However, in order for this to work properly, it is essential that the quantizer in the decoder be analogous to the quantizer in the encoder, and that the pseudo-random noise signal generated in the decoder be the same as that in the encoder. If these parameters are not known, it would not be possible to recreate the digital signal. In the combination of Todd et al. and Nishio et al., these parameters are known "a priori" and the devices are fixed accordingly.

The subject invention enables that these parameters may be variable in the encoder while still being compatible with a decoder. To that end, as claimed in claim 7, the parameters of the non-linear device used in the quantizer are included among the

encoded signals recorded on the recording medium, as well as the noise parameters used to define the pseudo-random noise signal.

Applicant therefore submits that while the combination of Todd et al. and Nishio et al. disclose recording a reduced word-length signal on a recording medium, this combination fails to disclose or suggest recording encoded signals, including the reduced word-length signal, non-linear device parameters and noise parameters, on the recording medium.

The subject invention, as claimed in claim 9, includes the "adding" and "quantizing" steps as described above. In addition, the method claimed therein includes "forming a difference signal, the difference signal being equal to the intermediate signal minus the reduced word-length signal" and "recording the difference signal, the non-linear device parameters and the noise parameters as the encoded signals on a recording medium". The invention as claimed in claim 9 differs from that in claim 7 in that the difference signal, as claimed, is recorded on the recording medium instead of the reduced word-length signal.

Applicant submits that while Nishio et al. discloses a difference circuit 12 that arguably forms such a difference signal, this difference signal is used to further process the input signal. Hence, Applicant submits that the combination of Todd et al. and Nishio et al. neither shows nor suggests "recording the difference

signal, the non-linear device parameters and the noise parameters as the encoded signals on the recording medium".

Claim 15 relates to a signal decoding apparatus for decoding encoded signals for reproducing an output signal corresponding to the input signal used to form the encoded signals, in which the encoded signals include a reduced word-length signal, non-linear device parameters and noise parameters. To that end, the decoder includes "means for extracting the reduced word-length signal, the non-linear device parameters and the noise parameters from the record carrier", "a quantization element coupled to said extracting means for processing said reduced word-length signal using a non-linear transfer function to form a decoded signal, said quantization element having a control input for receiving said non-linear device parameters for adjusting said non-linear transfer function to be inverse to a non-linear transfer function used to form said reduced word-length signal", "a noise source for providing a subtraction noise signal, said noise source having a control input for receiving said noise parameters for adjusting the subtraction noise signal to substantially equal to a noise signal used in forming said reduced word-length signal" and "a subtraction element for subtracting the subtraction noise signal from the decoded signal to form the output signal, whereby the output signal corresponds to the input signal".

Applicant submits that the combination of Todd et al. and Nishio et al. neither discloses nor suggests that the signals extracted from the record carrier include non-linear device parameters and noise parameters in addition to the reduced word-length signal. Applicant further submits that while the combination of Todd et al. and Nishio et al. arguably disclose a quantizer having a certain non-linear transfer function, and a noise generator having certain noise parameters, this combination fails to disclose or suggest extracting the non-linear device parameters and using the extracted non-linear device parameters to set the transfer function of the quantizer to be the inverse of that used in the quantizer for forming the reduced word-length signal. Further, Applicant submits that the combination of Todd et al. and Nishio et al. fails to disclose or suggest extracting the noise parameters and using the extracted noise parameters to set the noise source to produce a subtraction noise signal substantially equivalent to that used in forming the reduced word-length signal.

In view of the above, Applicant believes that the subject invention, as claimed, is not rendered obvious by the prior art, either individually or collectively, and as such, is patentable thereover.

Applicant believes that this application, containing claims 3, 5, 7-9, 12, 15 and 16, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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P.17